

CLAIMS

1. A system for suppressing interference in a communication of data channels across a common communication medium and the system for suppressing interference comprising:

5 a first set of modems coupled to the common communication medium for transport and reception of corresponding data channels there through;

a second set of modems coupled to the common communication medium for transport and reception of corresponding data channels there through; and

an interference canceller coupled with the second set of modems and  
10 configured to coordinate during a training phase transmissions of selected interfering data channels of the first set of modems and the second set of modems with reception of a selected victim channel at a corresponding one of the second set of modems and to adaptively derive interference cancellation coefficients between each victim data channel and each interfering data channel and to apply the derived interference  
15 cancellation coefficients during a runtime phase to digitized samples of the data channels received by each of the second set of modems to substantially cancel interference in the digitized samples.

2. The system for suppressing interference of Claim 1, wherein said interference  
20 canceller adaptively derives both FEXT and NEXT interference cancellation coefficients for each victim data channel.

3. The system for suppressing interference of Claim 2, wherein said interference  
25 canceller adaptively derive self-NEXT interference cancellation coefficients to substantially cancel an echo interference on each of the victim data channels.

4. The system for suppressing interference of Claim 1, wherein said interference  
canceller combines a selected training sequence with digitized samples received by a  
selected one of the second set of modems and resulting from a transmission of the  
30 selected training sequence by a corresponding one of the first set of modems, to

adaptively derive interference cancellation coefficients which correspond with the spectral characteristics of the selected data channel between the selected one of the second set of modems and the corresponding one of the first set of modems.

- 5 5. The system for suppressing interference of Claim 1, wherein said interference canceller further comprises:

banks of adaptive filters corresponding in number with a number of modems within said second set of modems and with each bank coupled to a selected one of the second set of modems and with the number of adaptive filters in each bank less in  
10 number than the number of modems; and

a switch fabric for selectively coupling filters within each bank with selected interfering data channels of the first set of modems and the second set of modems on the basis of relative magnitudes of the interference cancellation coefficients for each of the interfering data channels.

15

6. The system for suppressing interference of Claim 1, wherein said interference canceller further comprises:

banks of adaptive filters corresponding in number with a number of modems within said second set of modems and with each bank coupled to a selected one of the  
20 second set of modems and with the number of adaptive filters in each bank less in number than the number of modems;

an interpolator/decimator coupled to said bank of adaptive filters to decrease and increase a number of digitized samples for each of said received signals to correspond with relative bandwidths of each of the corresponding data channels.

25

7. The system for suppressing interference of Claim 1, wherein further said first set of modems and said second set of modems are each logical modems established by sharing signal processing power of a digital signal processor among multiple data channels.

8. The system for suppressing interference of Claim 1, wherein further the common communication medium comprises a wireless medium.

9. The system for suppressing interference of Claim 1, wherein further the  
5 common communication medium comprises a binder of subscriber lines.

10. The system for suppressing interference of Claim 1, wherein further said data channels include data modulated in at least one X-DSL protocol.

10 11. The system for suppressing interference of Claim 1, wherein further said at least one X-DSL protocol includes G.Lite, ADSL, VDSL, SDSL, MDSL, RADSL, and HDSL.

12. The system for suppressing interference of Claim 1, wherein further said at  
15 least one X-DSL protocol includes at least one of a discrete multi-tone (DMT) line code and carrier less AM/PM (CAP) line code.

13. An apparatus for suppressing interference in a communication of data channels across a common communication medium and the apparatus for suppressing interference comprising:

a plurality of analog front ends (AFE's) each coupled to common  
5 communication medium for transmission and reception of corresponding channels of data there through;

at least one digital signal processor (DSP) for processing the corresponding channels of data; and

an interference canceller coupled with the second set of modems and  
10 configured to coordinate during a training phase transmissions of selected interfering data channels with reception of a selected victim channel at a corresponding one of the plurality of AFEs to adaptively derive interference cancellation coefficients between each victim data channel and each interfering data channel and to apply the derived interference cancellation coefficients during a runtime phase to digitized samples of the  
15 data channels received by each corresponding one of the plurality of AFEs to substantially cancel interference in the digitized samples.

14. The apparatus for suppressing interference of Claim 13, wherein said interference canceller adaptively derives both FEXT and NEXT interference  
20 cancellation coefficients for each victim data channel.

15. The apparatus for suppressing interference of Claim 14, wherein said interference canceller adaptively derive self-NEXT interference cancellation coefficients to substantially cancel an echo interference on each of the victim data  
25 channels.

16. The apparatus for suppressing interference of Claim 13, wherein said interference canceller combines a selected training sequence with digitized samples received by a selected one of the second set of modems and resulting from a  
30 transmission across the common communication medium of the selected training

sequence via a selected data channel, to adaptively derive interference cancellation coefficients which correspond with the spectral characteristics of the selected data channel.

- 5 17. The apparatus for suppressing interference of Claim 13, wherein said interference canceller further comprises:

banks of adaptive filters corresponding in number with a number of said AFEs and with each bank coupled to a selected one of said AFEs and said DSP and with the number of adaptive filters in each bank less in number than the number of modems; and

- 10 a switch fabric for selectively coupling filters within each bank with selected interfering data channels transmitted and received by said AFE's on the basis of relative magnitudes of the interference cancellation coefficients for each of the interfering data channels.

- 15 18. The apparatus for suppressing interference of Claim 13, wherein said interference canceller further comprises:

banks of adaptive filters corresponding in number with a number of AFEs and with each bank coupled to a selected one of the AFEs and the DSP and with the number of adaptive filters in each bank less in number than the number of modems;

- 20 an interpolator/decimator coupled to said bank of adaptive filters to decrease and increase a number of digitized samples for each of said received signals to correspond with relative bandwidths of each of the corresponding data channels.

19. The apparatus for suppressing interference of Claim 13, wherein further said  
25 first set of modems and said second set of modems are each logical modems established by sharing signal processing power of a corresponding digital signal processor among multiple data channels.

20. The apparatus for suppressing interference of Claim 13, wherein further the common communication medium comprises a wireless medium.

21 The apparatus for suppressing interference of Claim 13, wherein further the  
5 common communication medium comprises a binder of subscriber lines.

22. The apparatus for suppressing interference of Claim 13, wherein further said data channels include data modulated in at least one X-DSL protocol.

10 23. The apparatus for suppressing interference of Claim 13, wherein further said at least one X-DSL protocol includes G.Lite, ADSL, VDSL, SDSL, MDSL, RADSL, and HDSL.

24. The apparatus for suppressing interference of Claim 13, wherein further said at  
15 least one X-DSL protocol includes at least one of a discrete multi-tone (DMT) line code and carrier less AM/PM (CAP) line code.

25. A method for suppressing interference in a communication of data channels across a common communication medium and the system for suppressing interference comprising the acts of:

adaptively filtering selected transmitted interfering data channels with at least  
5 one selected received data channel to determine during a training phase interference cancellation coefficients there between;

selecting for each received data channel at least one significant interfering data channel among the transmitted data channels based on said interference cancellation coefficients determined in said act of adaptively filtering; and

10 exclusively applying during a runtime phase the interference cancellation coefficients associated with the at least one significant interfering data channel selected in said selecting act to digitized samples of each corresponding received data channel to substantially cancel interference in the digitized samples.

15 26. The method for suppressing interference of Claim 25, further comprising the act of:

varying a number of the digitized samples to correspond with a bandwidth of the corresponding received data channel.

20 27. The method for suppressing interference of Claim 25, wherein the adaptively filtering act further comprises the act of:

training the at least one selected received data channel concurrently with all interfering data channels.

25 28. The method for suppressing interference of Claim 25, wherein the at least one selected received data channel includes all received data channels and the adaptively filtering act further comprises the act of:

training all of the received data channels with a selected one of the interfering data channels.